

50+ Years of NASA Astronaut Data - Architecting the Data and Analytics System

Kathy Johnson-Throop

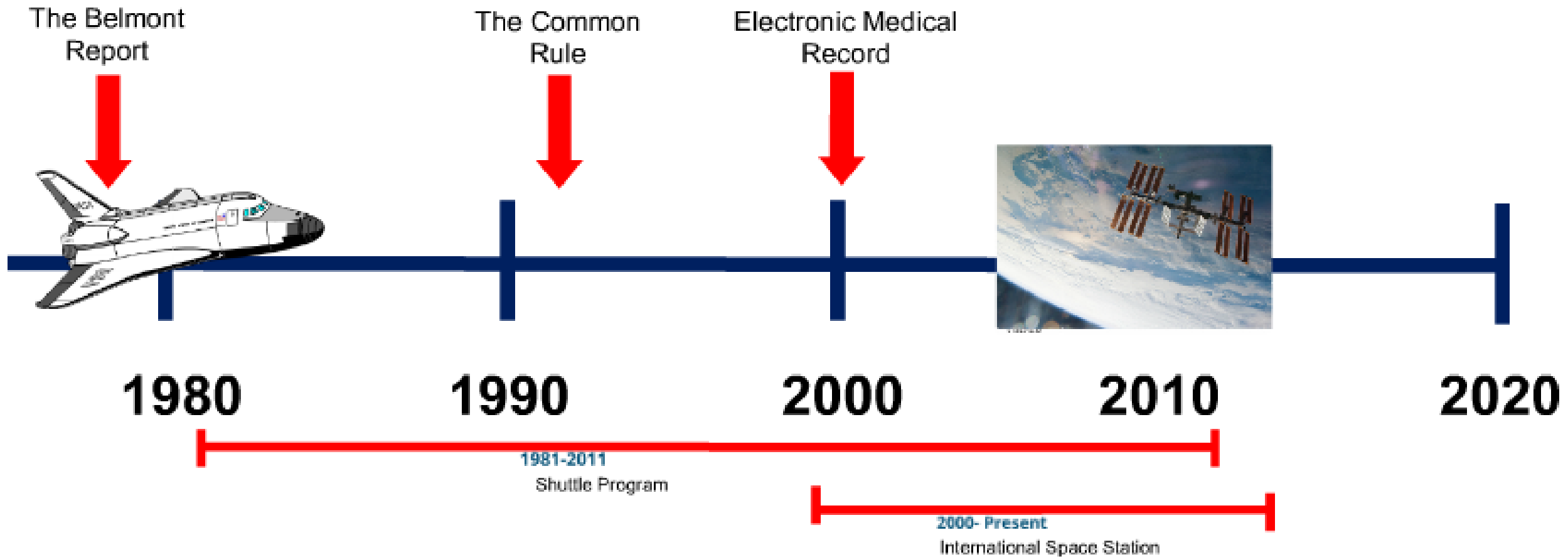
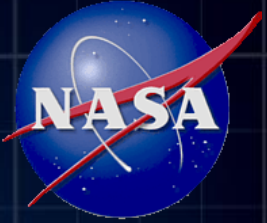
NASA Johnson Space Center

Slido.com

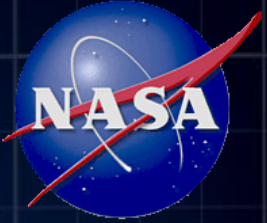
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Spaceflight Timeline



Medical Records

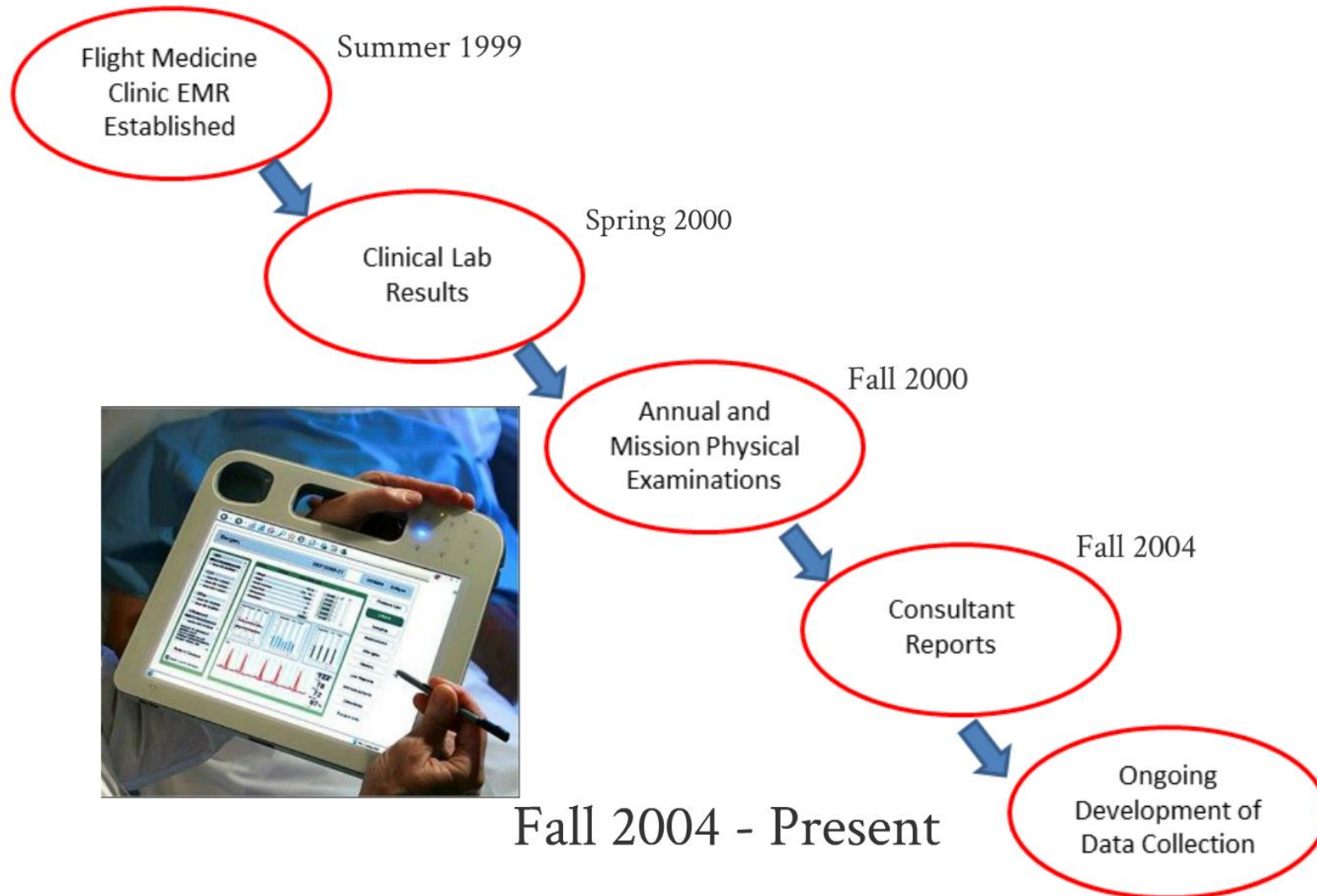
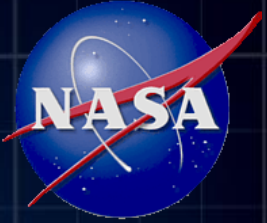


- In the late 90's NASA transitioned from traditional paper charts to an Electronic Medical Record system which improved the overall quality of care for astronauts in-flight and on the ground

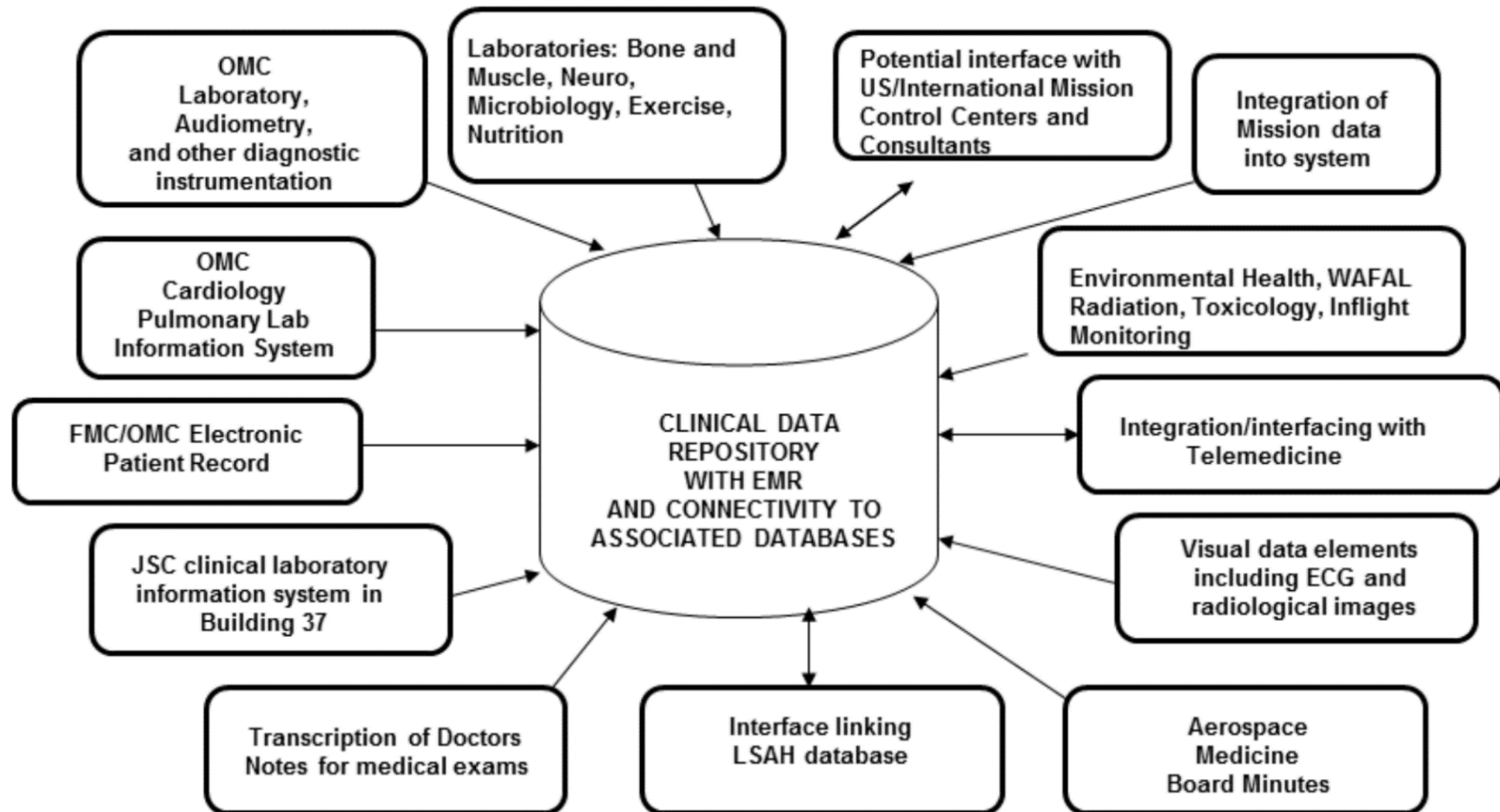
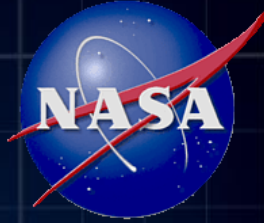


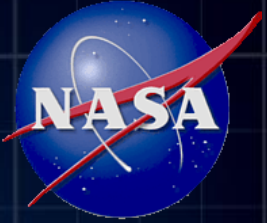
Chart for 1 astronaut

Going Digital Takes Time



Many Data Sources

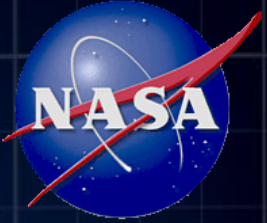




MED B #	Pre/In/Post-Flight MED B Requirements	Crew Clinical Health Occupational Monitoring	Re-certification	Preflight Time Points & Durations (minutes)																	In-flight	Postflight Time Points & Durations (minutes)																						
				L-27 mo.	L-24 mo.	L-18 mo.	L-365	L-365/270	L-365/240	L-365/180	L-330	L-270	L-270/180	L-240	L-240/180	L-210	L-180/90	L-150	L-90	L-60		L-20/10	L-10/7	L-2/1	R+0	R+0/1	R+0/3	R+3	R+3/7	R+4	R+5	R+5/7	R+5/30	R+7/10	R+7/14	R+10	R+14	R+14/30	R+20/30	R+29	R+30	R+60		
MAT Title	AME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41		

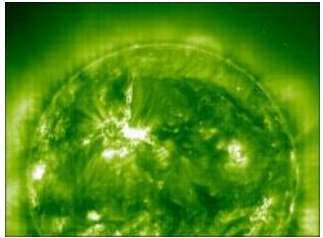
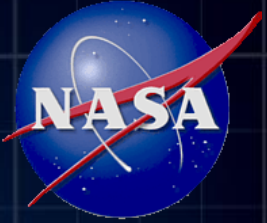
- Sparse Data Points
- Spread out over time

Transition to Occupational Health Surveillance



- Visual Impairment Intracranial Pressure (VIIP) Risk Assessment
 - In 2013 NASA reported that fifteen long-duration male astronauts (45–55 years of age) had experienced confirmed visual and anatomical changes during or after long-duration flights
 - Optic disc edema, globe flattening, choroidal folds, hyperopic shifts and an increased intracranial pressure were documented in these astronauts
- Initial VIIP Surveillance Data Set (20,000+ data points)
- Imaging/Consultant Reports: 284 reports (MRI, OCT, Optical Biometry)
- Vision Data: 66,000+ data points Reviewed; 500+ Updated/Corrected

50+ Years of Data = Evidence



Solar Flare (radiation)



Isolation

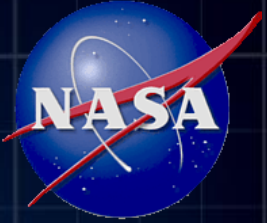


Confinement (small space)



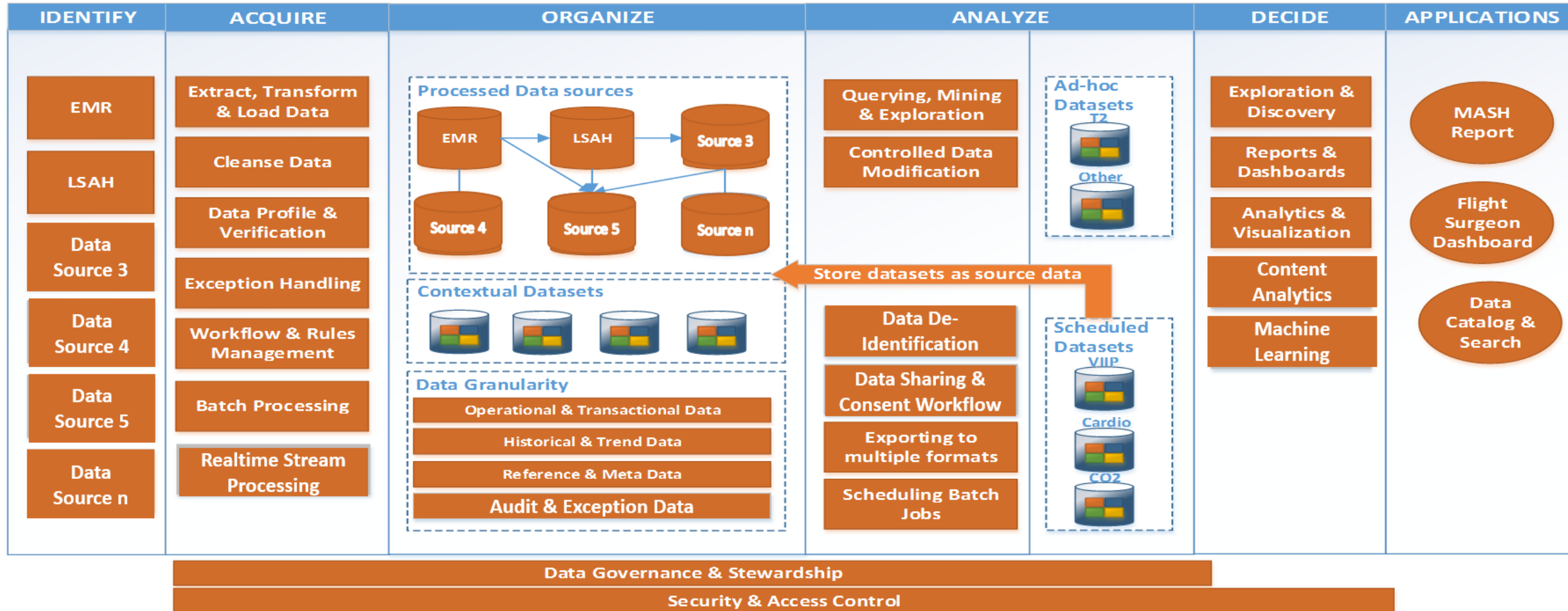
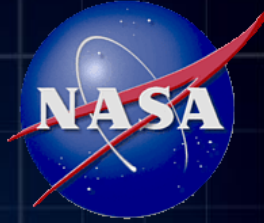
Sensory Differences

Key Questions



- Data Acquisition: What is the right balance between structured and free text when primary goals include both completeness and retrievability?
 - EMR contains a mix. For VIIP, a person had to read free text looking for indicators
- Data Extraction: How to pull data completely and repeatably given the mix of data in the systems?
 - Data continues to flow into the systems.
- Analytics: How to trend & monitor the data in the systems for occupational health surveillance? For known risks? For identifying potential risks?
 - What tools could help us monitor VIIP? Could tools have helped us find VIIP before the sentinel event?
- Meta data: Lab tests have changed over the years. Data was collected under many different conditions. How to best structure, capture and use this associated metadata?
- Change: How to structure an architecture that is adaptable to changing needs, changing technology?
 - For VIIP new tests were added, the frequency of tests changed.

Analytics Platform



Questions?

